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Perioperative Management of Pheochromocytoma: A Report of 5 Cases.

Abstract

Original Research Article

Background: Pheochromocytoma is a rare endocrine tumor characterized by an excessive production of catecholamines, responsible for severe cardiovascular and metabolic complications that significantly increase anesthetic risks during surgical resection.

Objective: To evaluate the perioperative anesthetic risks in pheochromocytoma surgery and to summarize recent advances in its anesthetic management. Methods: A prospective, descriptive and analytical study of 5 cases of pheochromocytoma operated in the Department of Anesthesiology and Surgical Intensive Care (Pavilion 17) of Ibn Rochd University Hospital, Casablanca, from May to November 2022. Patients operated by primary or conversion laparotomy were excluded.

Results: A female predominance was observed (60%), with a mean age of 44 years (range: 20–65 years). Arterial hypertension was present in 80% of patients and cardiac arrhythmias in 40%. Medical preparation relied mainly on calcium channel blockers, combined with beta-blockers in 40% of cases. Intraoperative complications were hemodynamic: hypertensive peaks (80%) during tumor manipulation, arrhythmias (20%), and post-excision hypotension (80%). Postoperatively, 60% of patients experienced hypotension; one death occurred due to cardiogenic shock. Conclusion: The anesthetic management of pheochromocytoma remains complex due to the major hemodynamic impact of catecholamine excess. Optimal medical preparation and rigorous intraoperative monitoring are essential to reduce morbidity and mortality.

Keywords: Pheochromocytoma; Arterial hypertension; Anesthesia; Intraoperative complications; Catecholamines.

INTRODUCTION

Pheochromocytoma is a rare, most often benign, neuroendocrine tumor arising from the chromaffin tissue of the sympathetic nervous system, embryologically derived from the neural crest. In about 90% of cases, the tumor is located in the adrenal medulla; when extra-adrenal, it is referred to as a paraganglioma.

This tumor secretes excessive amounts of catecholamines (adrenaline, noradrenaline, dopamine), inducing a hyperadrenergic state responsible for major hemodynamic changes and severe cardiovascular and metabolic complications. Arterial hypertension (AHT) is the most frequent symptom, often paroxysmal and associated with Menard's triad (headache, sweating, palpitations).

The reference treatment is surgical. However, tumor resection carries major anesthetic risks, particularly hypertensive crises during tumor manipulation and cardiovascular collapse after venous clamping. The aim of this work is to evaluate perioperative anesthetic risks and to analyze the perioperative management through five clinical cases.

METHODS

Study design and setting

This was a prospective, descriptive and analytical study conducted over a six-month period (May to November 2022) in the Department of Anesthesiology and Surgical Intensive Care (Pavilion 17) of Ibn Rochd University Hospital, Casablanca.

Study population

All patients with a biologically and radiologically confirmed pheochromocytoma, scheduled for surgical treatment, were included. Patients operated by primary laparotomy or conversion laparotomy were excluded.

Collected variables

The collected data included demographic characteristics (age, sex), medical history, anesthetic risk assessment (cardiovascular and metabolic status), tumor mass characteristics, preoperative preparation, anesthetic technique, intraoperative

complications, and postoperative outcome.

Statistical analysis

A descriptive analysis was performed: qualitative variables are expressed as numbers and percentages, and quantitative variables as means with their ranges.

RESULTS

General characteristics of the population

The mean age of patients was 44 years (range: 20 to 65 years), with a female predominance (60% women, 40% men; sex ratio of 0.6).

Preoperative evaluation

From a cardiovascular standpoint, arterial hypertension was present in 80% of patients (4/5). Cardiac arrhythmias (extrasystoles, supraventricular tachycardia) were noted in 40% of patients. Echocardiography revealed left ventricular hypertrophy in two patients, associated with ischemic heart disease in one of them. Metabolically, hyperglycemia was found in 60% of patients.

Tumor characteristics

Abdominal CT showed a preferential location in the left adrenal gland (3 cases) versus 2 cases on the right, with no bilateral involvement or ectopic location. The mean tumor size was 5 cm (range: 3 to 8 cm).

Preoperative preparation

Medical preparation systematically relied on calcium channel blockers, supplemented by a beta-blocker in the two patients with arrhythmias. Anxiolytic premedication (benzodiazepines) was administered to the coronary patient to prevent stress-related hypertensive peaks.

Intraoperative management

All patients underwent general anesthesia, sometimes combined with epidural anesthesia, preceded by vascular filling (500 to 1000 ml of isotonic saline). Induction combined Propofol and Fentanyl, with Rocuronium as the muscle relaxant; maintenance was provided by Isoflurane. Monitoring systematically included invasive blood pressure

measurement, ST-segment monitoring, SpO2, and capnography.

Intraoperative complications, exclusively hemodynamic, were frequent: hypertensive peaks (80% of cases) occurring during tumor manipulation and treated by deepening anesthesia and Nicardipine; arrhythmias (20%) treated with beta-blockers; and arterial hypotension (80%) occurring after tumor excision, requiring vascular filling and noradrenaline.

Postoperative course

Postoperatively, 60% of patients experienced hypotension requiring continued vasopressor support. The mean length of stay in intensive care was 48 hours. One death occurred on day 8, secondary to cardiogenic shock in the patient with severe ischemic heart disease.

DISCUSSION

The management of pheochromocytoma represents a real challenge for the anesthesiologist-intensivist. Our results are consistent with the literature regarding the predominance of arterial hypertension as the cardinal symptom. Preoperative medical preparation is a crucial step; while alpha-blockers have long been the first-line treatment, our series illustrates the current trend favoring calcium channel blockers, which are effective and associated with fewer severe postoperative hypotensions.

The intraoperative period is marked by major hemodynamic instability. Hypertensive peaks during tumor manipulation are almost constant and require fast-acting hypotensive agents such as Nicardipine. Conversely, the abrupt collapse of catecholamine levels after venous clamping leads to vasoplegia and profound hypotension, justifying anticipated volume expansion and the use of noradrenaline.

The death observed in our series is a reminder that mortality, although markedly decreasing thanks to advances in intensive care, remains closely linked to the chronic cardiovascular impact of hypercatecholaminemia (catecholaminergic cardiomyopathy, ischemic heart disease).

CONCLUSION

Recent advances in diagnosis, laparoscopic surgery and anesthesia have considerably improved the quality of care for patients undergoing pheochromocytoma surgery. Optimal

medical preparation and careful cardiovascular assessment are essential to limit morbidity and mortality. Intraoperatively, the acute release of catecholamines requires continuous invasive monitoring and immediate responsiveness of the anesthetic team to extreme hemodynamic variations. Postoperatively, intensive care monitoring remains mandatory to detect and treat withdrawal hypotension and metabolic complications.

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